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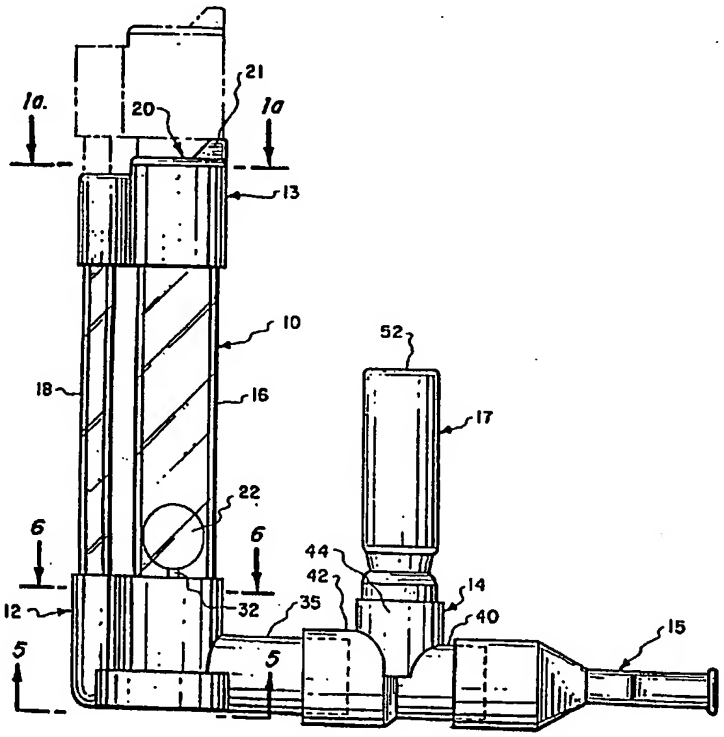
(30) 1995/01/18 (08/375,157) US

(54) **ADAPTATEUR POUR DOSEUR DE MEDICAMENTS AYANT UN SPIROMETRE DE STIMULATION AMELIORE**

(54) **METERED DOSE MEDICATION ADAPTOR WITH IMPROVED INCENTIVE SPIROMETER**



(57) Cette invention concerne un adaptateur et un spiromètre de stimulation pour l'administration de médicaments à des patients à l'aide d'un aérosol-doseur comportant des boîtiers filtrants (17), ce qui permet d'obtenir une résistance lors de l'inspiration et de contrôler le débit afin d'améliorer l'administration de médicaments aux poumons. Cet appareil amélioré se compose d'un adaptateur universel unique (14), et possède une entrée conçue pour recevoir divers dispositifs de stimulation (10), une sortie sur laquelle se fixe un embout (15), ainsi qu'un culot (44) destiné à recevoir le boîtier filtrant (17) du doseur de médicaments. Ce culot est conçu de manière à s'adapter à un grand nombre de buses d'aérosols-doseurs et comprend une buse en fente (58) afin d'améliorer la pulvérisation en brouillard. L'entrée de l'adaptateur universel est conçue de manière à améliorer la pénétration du médicament.

(57) This invention is an adaptor and incentive spirometer for delivering medication to patients from metered dose inhaler (MDI) canisters (17), providing inspiratory resistance and controlled flow rate for more efficient delivery of medication to the lungs. The improved apparatus is comprised of a unique universal adaptor (14) and has an inlet configured to receive a variety of incentive devices (10), an outlet to connect a mouthpiece (15) and a socket (44) for receiving a metered dose medication canister (17). The socket is constructed to accept a wide variety of MDI spray tips and includes a nozzle spray tip (58) to provide optimum misting. The inlet of the universal adaptor is constructed to improve medication penetration.

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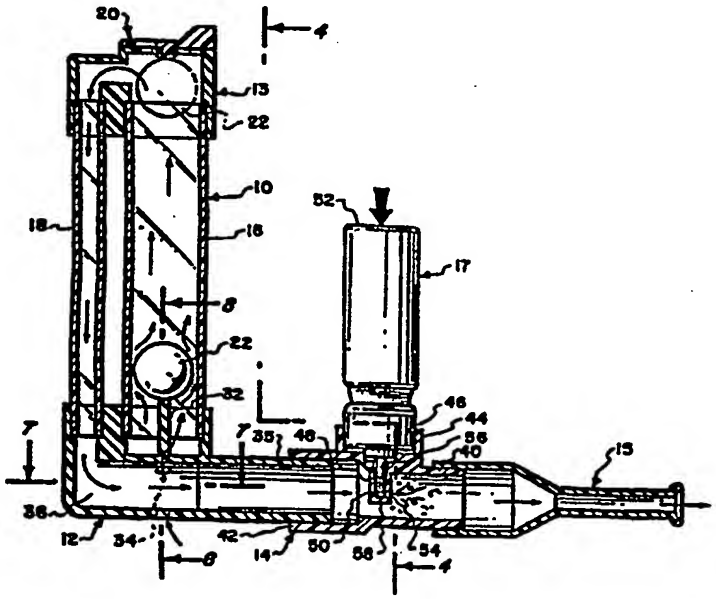
(54) Title: METERED DOSE MEDICATION ADAPTOR WITH IMPROVED INCENTIVE SPIROMETER



(57) Abstract

This invention is an adaptor and incentive spirometer for delivering medication to patients from metered dose inhaler (MDI) canisters (17), providing inspiratory resistance and controlled flow rate for more efficient delivery of medication to the lungs. The improved apparatus is comprised of a unique universal adaptor (14) and has an inlet configured to receive a variety of incentive devices (10), an outlet to connect a mouthpiece (15) and a socket (44) for receiving a metered dose medication canister (17). The socket is constructed to accept a wide variety of MDI spray tips and includes a nozzle spray tip (58) to provide optimum misting. The inlet of the universal adaptor is constructed to improve medication penetration.

TITLE: METERED DOSE MEDICATION ADAPTOR WITH IMPROVED INCENTIVE SPIROMETER

DESCRIPTION

INTRODUCTION

When fully assembled, the improved incentive spirometer (Inspiratory Flow Control Device) is easily held, even by a child. The rising ball (#1) provides visual reinforcement. A distinctive, and quite audible, "click" is made when the ball reaches the top of the large tube (#2) to aid the visually impaired.

CONCEPT

When you inhale through the mouthpiece (#3), the air goes through the large and small tubes (#2 & #4), past a series of apertures in the top and bottom (#5 & #6), causing the weighted ball (#1) to rise. The apertures (#5 & #6) control cc/second airflow. (See also, Apertures, infra.) Thus, when you inhale, you are doing so under resistance. This resistance creates an airstream which travels directly to the lungs.

If you turn the improved incentive spirometer (Inspiratory Flow Control Device) over, and exhale into the mouthpiece (#3), you create an expiratory air flow, which can also be measured.

APERTURES

There are four settings for air flow (#7). These air flow rates are regulated by a dial (#8) and apertures at the top of the improved incentive spirometer (Inspiratory Flow Control Device) (#5), and apertures in the bottom (#6). Detent in the aperture dial guarantees precise setting.

MDI THERAPY

When used in conjunction with the metered dose medication adaptor (#9), a medication delivery system for MDI therapy is achieved.

The subject would exhale then inhale through the mouthpiece (#3), counting the number of seconds the ball (#1) is held at the top of the tube (#10). This establishes the amount of time the subject has to actuate the medication.

The subject puts the medication canister (#11) into the specially designed port (#12) in the metered dose medication adaptor. Subject then inhales, bringing the ball (#1) to the top of the tube (#10), actuates the medication (#11), and continues to hold the ball (#1) aloft as long as possible. There is no necessity to coordinate inhalation with actuation. (See also, Inspiratory & Expiratory Exercise, infra.)

RESULT: The medication is picked up by the airstream and carried to the lungs.

Metered dose medication adaptor port (#12) accepts most MDI canisters.

NEBULIZATION THERAPY

Improved incentive spirometer (Inspiratory Flow Control Device) can be hooked up to a "T" adaptor that comes with a nebulization bowl. There now is a closed system with no expulsion of medication into the air through what would otherwise be the open end of the "T" adaptor. This results in greater propulsion of the medication coming out the only available opening - the mouthpiece (#3).

RESULT: When the subject inhales with the nebulizer hooked up to improved incentive spirometer (Inspiratory Flow Control Device), the resistance created by improved incentive spirometer (Inspiratory Flow Control Device) provides for delivery of medication under prescribed resistance.

INSPIRATORY & EXPIRATORY EXERCISE

Inspiratory Flow Control Device may be used for inspiratory and expiratory exercise. Inhalation exercise is done with the unit upright. Turning the Inspiratory Flow Control Device upside down and blowing into it creates exhalation exercise.

When used in conjunction with MDI therapy, at the point the subject would normally exhale, after actuation, the Inspiratory Flow Control Device is turned over and exhaled into.

RESULT: Controlled inhalation and exhalation under resistance.

OTHER USES

The metered dose medication adaptor can also be equipped with a whistle in place of the improved incentive spirometer (Inspiratory Flow Control Device), or a variety of additional devices. The Inspiratory Flow Control Device could be equipped or mounted on a y-shaped connector for use with a pair of incentive spirometers or multiple metered inhaler devices. Another alternative is to connect a spiraling dispensing chamber to the metered dose medication adaptor for circulating the medication to improve vaporization before inhalation.

The unique construction of the metered dose medication adaptor also provides for other applications. A variety of constructions for the dispensing jet are available to improve the vaporization of medication and allow different angles of delivery. Variations in delivery angle can be effective in producing a finer mist by impacting vapor on the walls of the tube to reduce particle size. New medications under development can benefit from this ability to vary and improve particle size. Additionally, the metered dose medication adaptor can be cascaded for use with multiple metered

dose inhalers. The metered dose medication adaptor permits a wide range and variety of uses for metered dose inhalers.

CONCLUSION

Improved incentive spirometer (Inspiratory Flow Control Device) is an elegantly simple device that performs at a complex level, employing a completely new concept. We believe all of the above mentioned factors may result in improved patient compliance, efficient and effective delivery of expensive medication, reduced incidents of emergency doctor/hospital visits, more and better home care, less staff time for monitoring and training.

PARTS

No.	Item
1	Weighted ball
2	Large tube
3	Mouthpiece
4	Small tube
5	Top apertures
6	Bottom apertures
7	Calibration markings (not shown)
8	Dial
9	Actuator Device
10	Top of tube
11	Medication canister
12	Port in Actuator Device

CLAIMS

1. An Inspiratory Flow Control Device in which said incentive spirometer comprises; first and second tubes; a bottom cap constructed to receive a lower end of said first and second tubes; a top cap constructed to receive and connect an upper end of said first and second tubes; a regulating ball in said first tube; a cylindrical pedestal in said bottom cap to hold said regulating ball spaced from the bottom end of said first tube, the diameter of said pedestal being substantially smaller than the diameter of said first tube; an outlet in said bottom cap communicating with said second tube for connecting a mouthpiece; air inlet means in the bottom cap in communication with said first tube; whereby air drawn through said outlet causes air to be drawn through said inlet in said first tube to raise said ball in said first tube so that said ball indicates the volume of air being inspired.

2. An Inspiratory Flow Control Device in which the selectably variable resistance means comprises; a plurality of holes in said top cap; a rotatable disc mounted on said top cap; said rotatable disc having an arcuate slot for selective registration with said plurality of holes; whereby rotation of said disc increases or decreases the maximum volume of airflow in said incentive spirometer.

3. An Inspiratory Flow Control Device in which said selectably variable resistance means includes incremental means for varying airflow volume in selected incremental amounts.

4. An Inspiratory Flow Control Device in which said incremental means comprises; an arcuate channel in said top cap; a plurality of spaced apart detents in said arcuate channel; and a pin on said rotatable disc engaging said arcuate channel; whereby rotation of said rotatable disc moves said pin from one detent to another to

provide a positive indication of an incremental adjustment in airflow volume.

5. An Inspiratory Flow Control Device in which said selectably variable resistance means comprises; a plurality of hole in said top cap; a rotatable disc mounted on said top cap; said rotatable disc having an arcuate slot for selective registration with said plurality of holes; whereby rotation of said disc increases or decreases the maximum volume of airflow in said incentive spirometer.

6. An Inspiratory Flow Control Device in which said selectably variable resistance means includes incremental means for varying airflow volume in selected incremental amounts.

7. An Inspiratory Flow Control Device in which said incremental means comprises; an arcuate channel in said top cap; a plurality of spaced apart detents in said arcuate channel; and a pin on said rotatable disc engaging said arcuate channel; whereby rotation of said rotatable disc moves said pin from one detent to another to provide a positive indication of an incremental adjustment in airflow volume.

8. An Inspiratory Flow Control Device for controlling inspiratory airflow under resistance for inhalation therapy comprising:

a first universal adaptor having means for receiving an MDI canister having a spray tip, said first universal adaptor having a first end and a second end and an axis connecting said ends;

a tapered mouthpiece connectable to said first end of said first universal adaptor, said tapered mouthpiece providing means for accelerating a flow of air passing through said first universal adaptor and into the mouth of a user;

an incentive spirometer means connectable to said second end of said first

universal adaptor, said incentive spirometer means for indicating a user's inhalation flow rate and for indicating the optimal inhaled volume for activation of an MDI canister; said incentive spirometer further comprising selectably variable resistance means for regulating inspiratory airflow.

9. The Inspiratory Flow Control Device wherein said first universal adapter further comprises a whistle.

10. The Inspiratory Flow Control Device wherein said first universal adaptor further comprises a tapered passageway means for accepting a variety of MDI canister nozzles.

11. The Inspiratory Flow Control Device wherein said first universal adaptor further comprises a nozzle jet.

12. The Inspiratory Flow Control Device wherein said nozzle jet is angled with respect to said axis of said first universal adaptor.

13. The Inspiratory Flow Control Device further comprising a second universal adaptor and receiving a second MDI canister and spray stem, and having a first end and a second end; said second end of said second universal adaptor connectable to said first end of said first universal adaptor, and said first end of said second universal adaptor connectable to said mouthpiece.

14. The Inspiratory Flow Control Device wherein one or more additional universal adaptors are selectably connectable in end-to-end fashion between said first and second universal adaptors.

15. An improved inspiratory and expiratory breathing exerciser comprising:

a pair of incentive spirometers, each said incentive spirometer comprising first and second tubes; a bottom cap constructed to receive a lower end of said first and second tubes; a top cap constructed to receive and connect an upper end of said first and second tubes; a regulating ball in said first tube; an outlet in said bottom cap communicated with said second tube for connecting a respiratory flow; air inlets in the bottom cap in communication with said first tube; and selectably variable means for regulating respiratory airflow; whereby air drawn through said outlet causes air passed through said inlet in said first tube to move said ball in said first tube so that said ball indicates the volume of air passing through the spirometer;

a first of said pair of incentive spirometers being oriented right side up, a second of said pair of incentive spirometers being oriented upside down;

a y-shaped adaptor having an inlet/outlet for connecting a mouthpiece; an inlet connected to said first incentive spirometer and an outlet connected to said second incentive spirometer;

whereby said breathing exerciser meters inhaled and exhaled air when said outlets in said bottom caps of said incentive spirometers are subject to respiratory flow through said y-shaped adaptor.

16. An improved breathing exerciser wherein each of said selectably variable resistance means further comprises: a plurality of holes in said top cap; a rotatable disc mounted on said top cap; said rotatable disc having an arcuate slot for selective registration with said plurality of holes; whereby rotation of said disc increases or decreases the maximum airflow in said incentive spirometers.

17. An improved breathing exerciser wherein each of said selectably variable resistance means further comprises a pin on said rotatable disc engaging said arcuate slot.

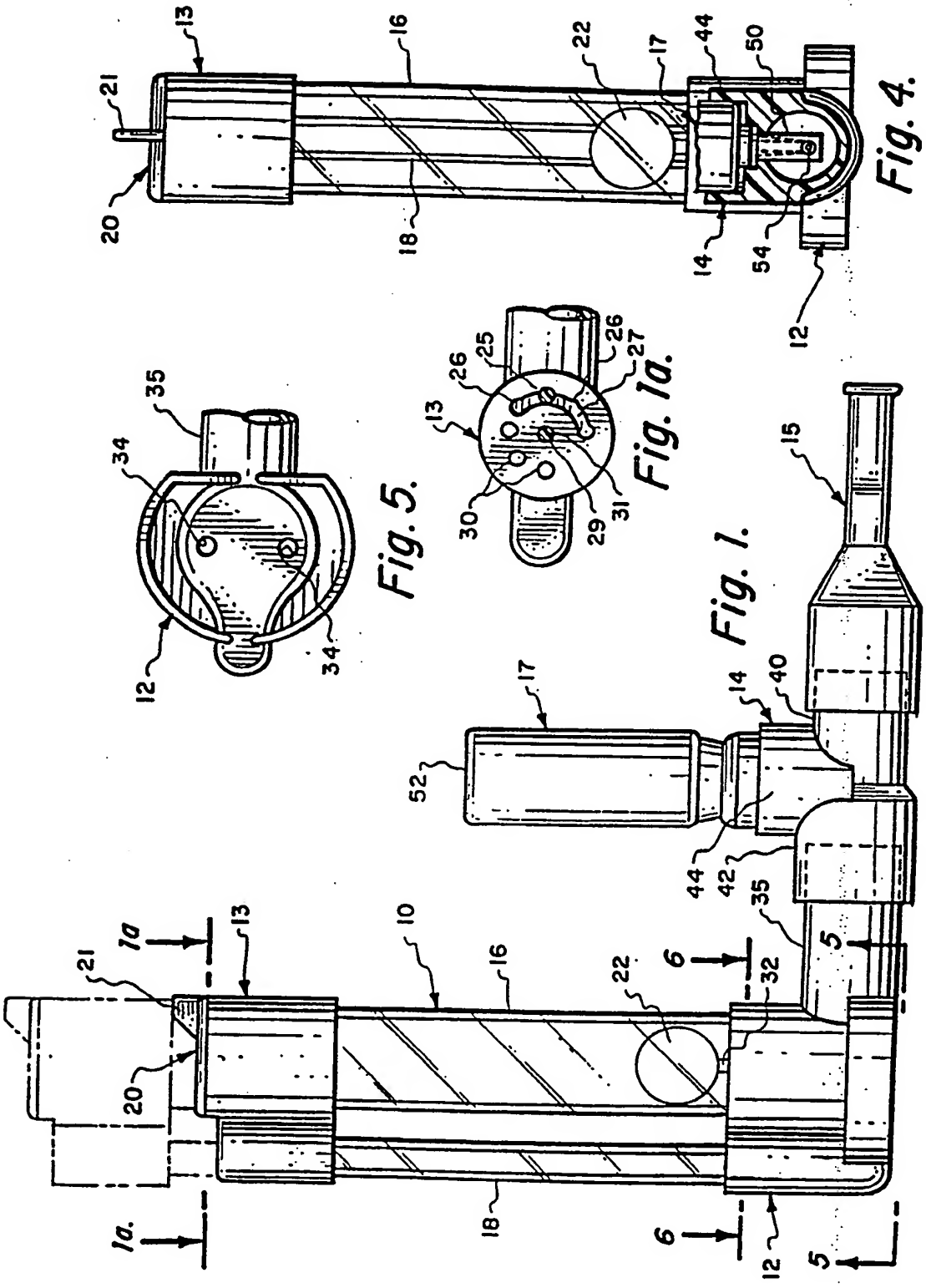

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Fig. 5.
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Fig. 1a.
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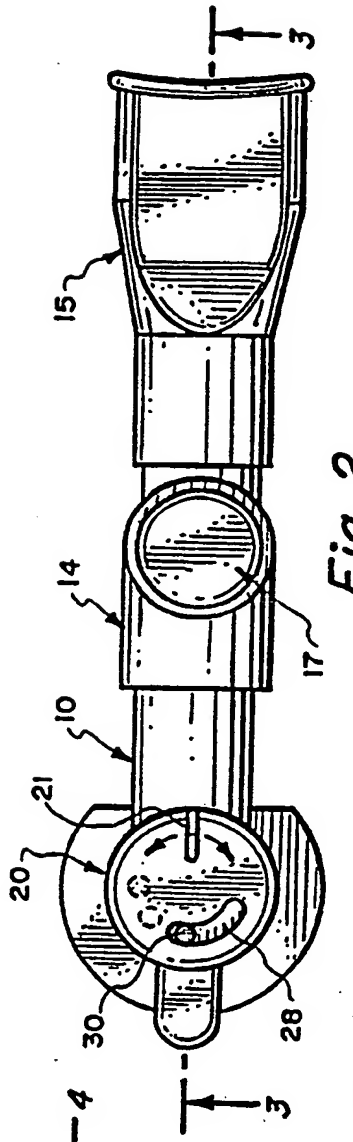

Fig. 2.

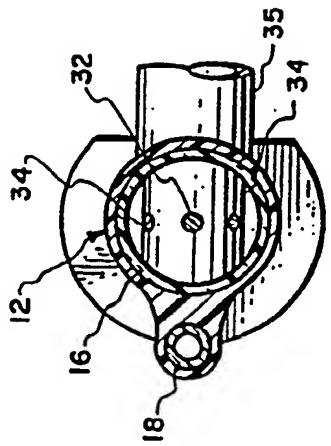

Fig. 6.

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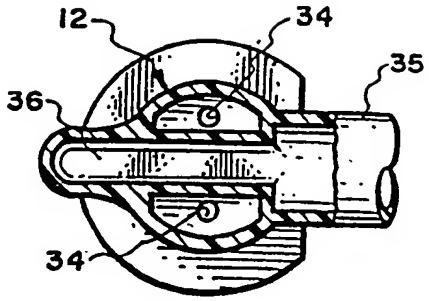

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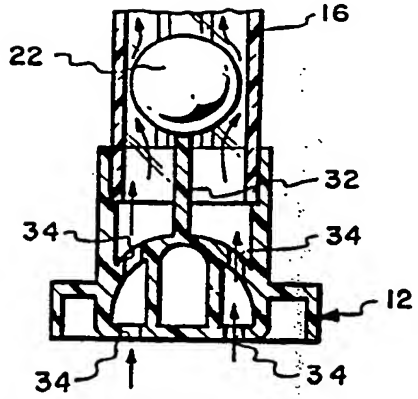

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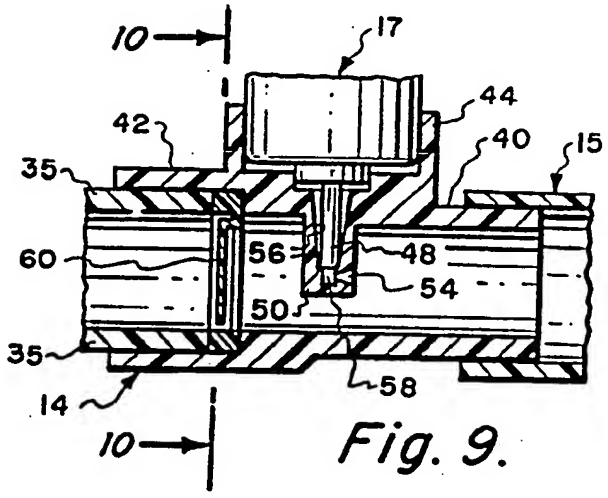

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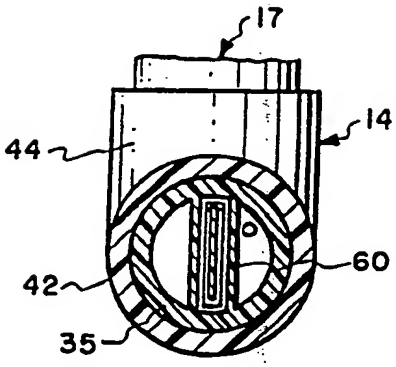

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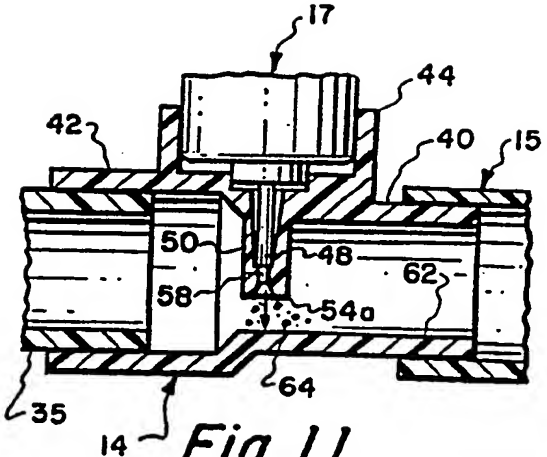

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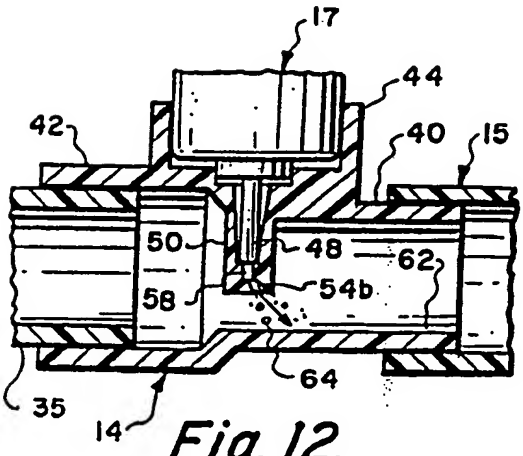

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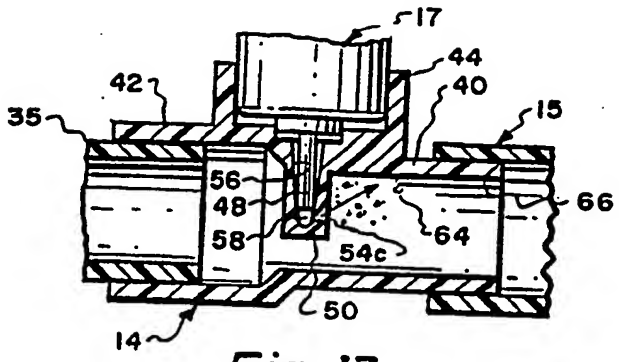

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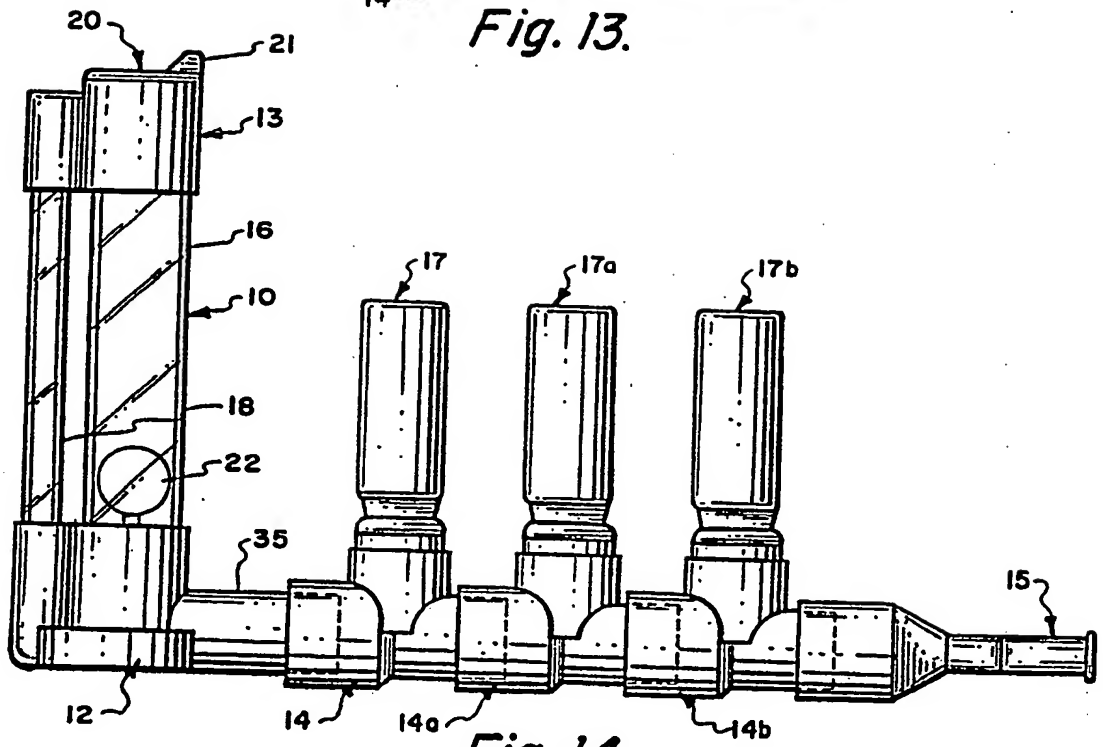
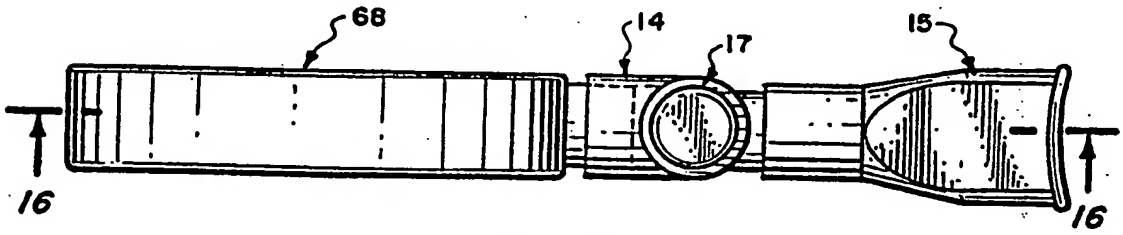


Fig. 14.



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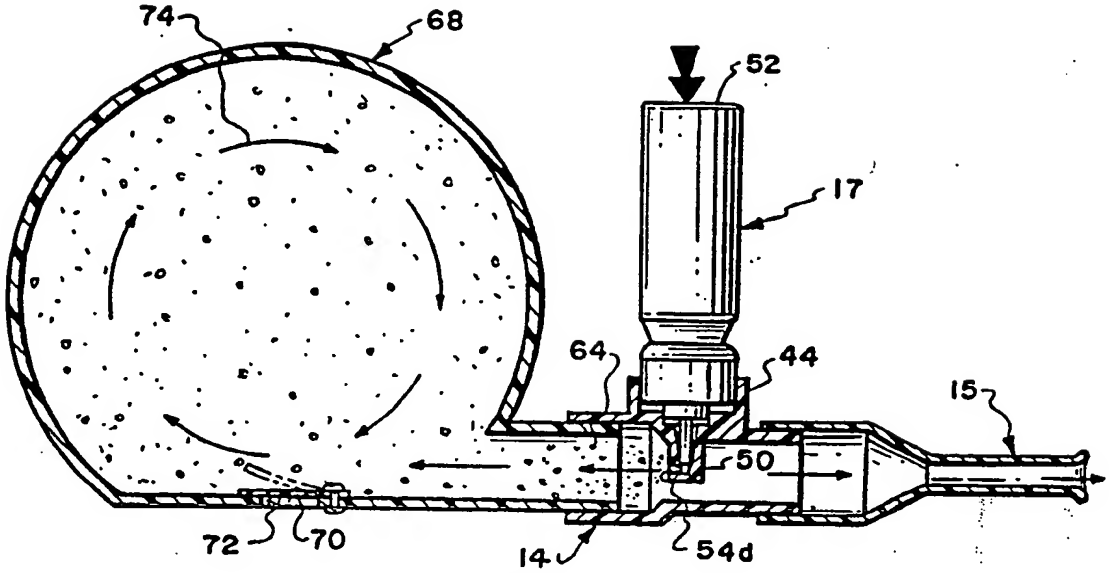

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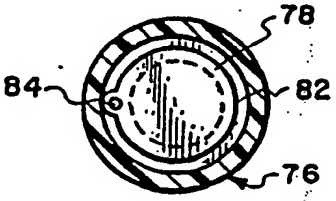
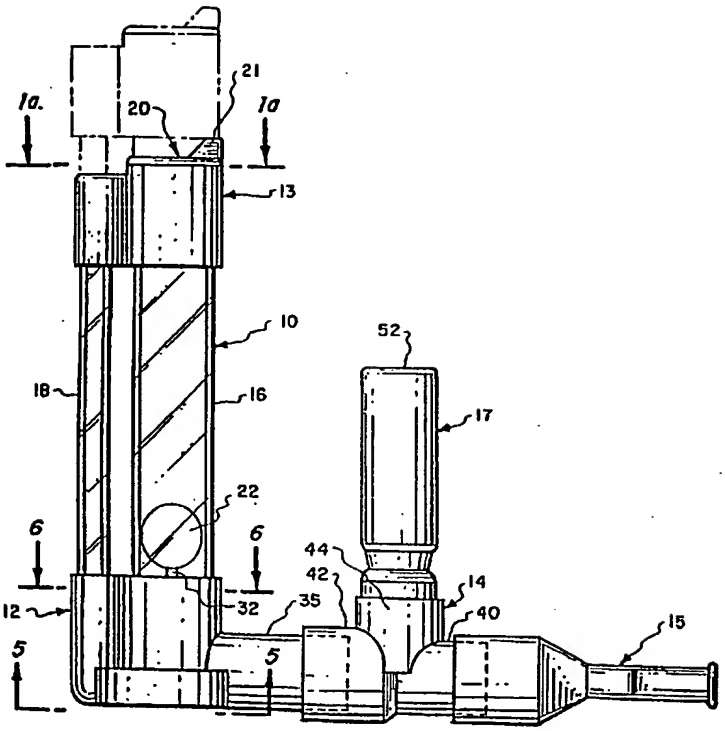


Fig. 18.

Fig. 17.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